Collider User Training

Learning Objectives
or
Why Take This Course?

- Access into Collider experimental areas
- Requirements for entry into these areas
- Conventional & Radiological Safety Hazards
- Response to emergencies
- Equivalency for GERT
- Equivalency for ODH Training

C-A Conduct of Operations

- On-duty Operations Coordinator is responsible for the safe operation of accelerator complex
- Maintenance Coordinator is responsible for safe operation and coordination during shut down periods
- Definitive lines of authority
- Written procedures exist for most operations
- Use of qualified and trained personnel
- Appropriate authorizations and work permits

Liaison Physicists

http://server.ags.bnl.gov/bnlags/liaisons.html

STAR	Wuzheng Meng	2120
PHENIX	Yousef Makdisi	4932
PHOBOS	Don Barton	7925
BRAHMS	Dana Beavis	7124
PP2PP	I-Hung Chiang	7903

GERT

General Employee Radiation Training

- **Allows access in CONTROLLED areas.**
- **Allows radiation exposure up to 100 mrem/yr., less than 5 mrem/hr.**

DOES NOT ALLOW ACCESS IN TLD-REQUIRED AREAS.

ALARA Philosophy

RADIATION EXPOSURE MUST :

Have A Net Benefit

Be **A**S **L**OW **A**S **R**EASONABLY **A**CHIEVABLE

Be Within Limits

Basic ALARA strategy on the part of the worker revolves around effective use of Time, Distance and Shielding. ALARA may also be incorporated into design and operations.

Areas controlled for radiation protection

Controlled Area -- any area where access is controlled due to the presence of radiation above natural background levels or due to the presence of man-made radioactive materials. As a minimum, these areas are posted "Controlled Area."

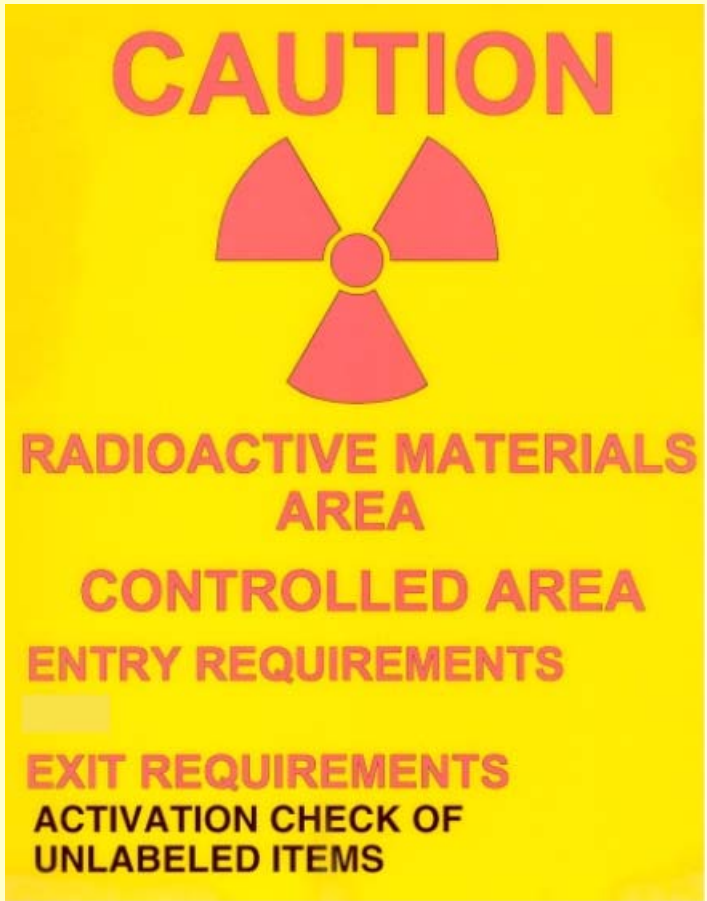
Radiation Area -- any accessible area where an individual may receive a whole-body dose greater than 5 mrem in one hour at 30 cm (1 ft). As a minimum, these areas are posted "Radiation Area, TLD Badge Required."

High Radiation Area -- any accessible area where an individual may receive a whole-body dose greater than 100 mrem in one hour at 30 cm (1 ft). As a minimum, these areas are posted "Danger, High Radiation Area, TLD Badge and SRD Required."

RHIC Inner Ring Road

Activation Check Required

Radioactive Materials Area



This posting means you must not release items from the area without checking for activation.

Contact the HP office (x4660) to perform activation check.

RHIC Tunnel

Note: - TLD Required

- Activation Check Required

PRIMARY BEAM:

100,000,000, rem/hr

(for Gold ion beam)

RHIC experimental areas:

Normal Operations

CONTROLLED AREA

< 5 mrem / hr

< 100 mrem / yr.

Sealed Radiation Sources

Contact the C-AD Sealed Source Custodian.

Have sources inventoried and leak-checked by C-AD Health Physics.

Complete the source inventory form. Keep the form with the source.

DO NOT LOITER AROUND SOURCE STORGE BOXES

Price Anderson Amendment Act (PAAA)

• Failure to comply with radiological rules, or to identify and report radiological non-compliance to DOE , subjects the Laboratory to enforcement action.

• Worker Responsibilities include:

  • Comply with requirements

  • Report non-compliance

  • Obey Radiological Stop Work Order

WARNING

Willful or flagrant disregard of Federal Radiation Protection Rules may results in disciplinary action.

Deliveries at C-A

All persons, including delivery people, who enter Controlled Areas either must be escorted by a trained Radiation Worker or they must be a Radiation Worker.

In order to ensure that delivery people do not wander into Controlled Areas, all deliveries are to be made to non-posted areas of the complex.

- Deliveries can be made to **Building 100**
- Deliveries for off hours can be made to the Main Control Room (x 4662)

To **Ship** material off the BNL site (other than printed documentation) material must go through one of the laboratory's special shipping divisions. Contact your Liaison Physicist or Liaison Engineer for assistance.

Particle Accelerator Safety System (PASS)

ACCESS PROHIBITED

↓

BEAM DISABLED

↓

CONTROLLED ACCESS

↓

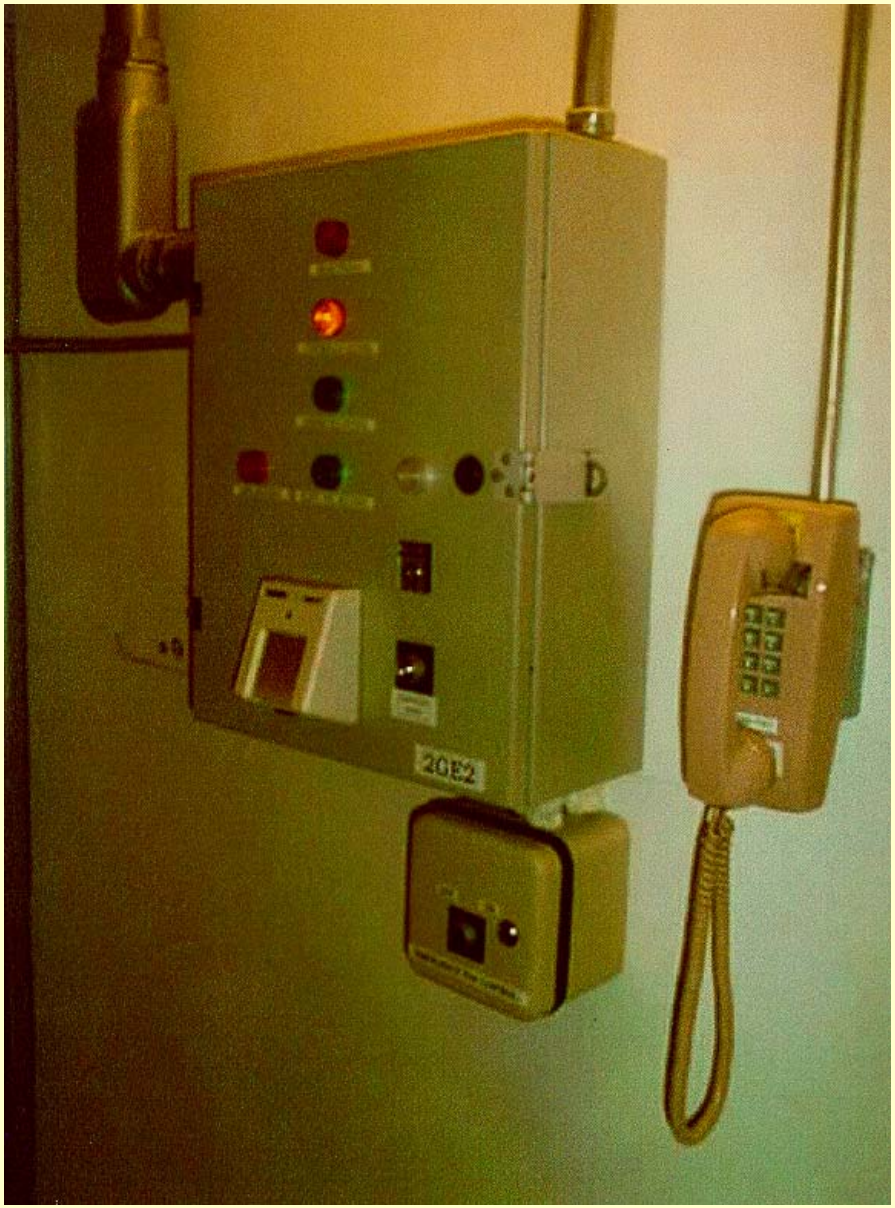
RESTRICTED ACCESS

Purpose of PASS

- Designed for Radiation Protection
- Designed for ODH Protection
- Card used during Restricted Access
- Key used during Controlled Access Mode
- One Card/Key, One Person, One Access!

Control Panels

PASS Card




PASS
RHIC
Place Flat on Reader Plate
FRONT
PASS
RHIC
Place Flat on Reader Plate
FRONT

Red Entry Mode

RED LIGHT- NO ACCESS

This mode means that the beam or RF is about to be turned on, or is present in the enclosure

Yellow Entry Mode

YELLOW LIGHT- CONTROLLED ACCESS

CA Key & MCR Supervision Required

Confirmed by Shift Leaders to Access Experiments.

Get Key from MCR Keytree.

Call MCR from Access Gate, be observed by video, a tone will sound , open Gate.

Yellow Exit Light means MCR must open gate to Exit.

Call MCR and Wait to hear buzzer.

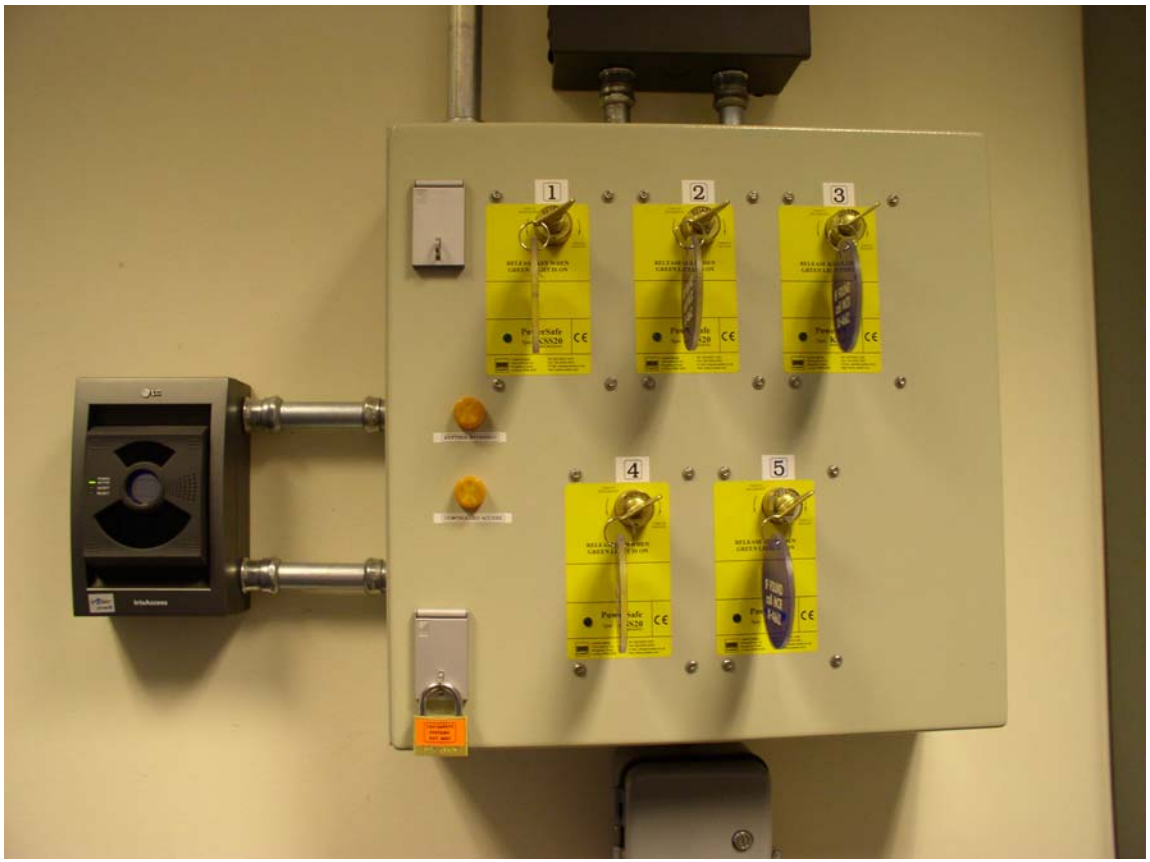
Green Entry Mode

GREEN LIGHT- RESTRICTED ACCESS

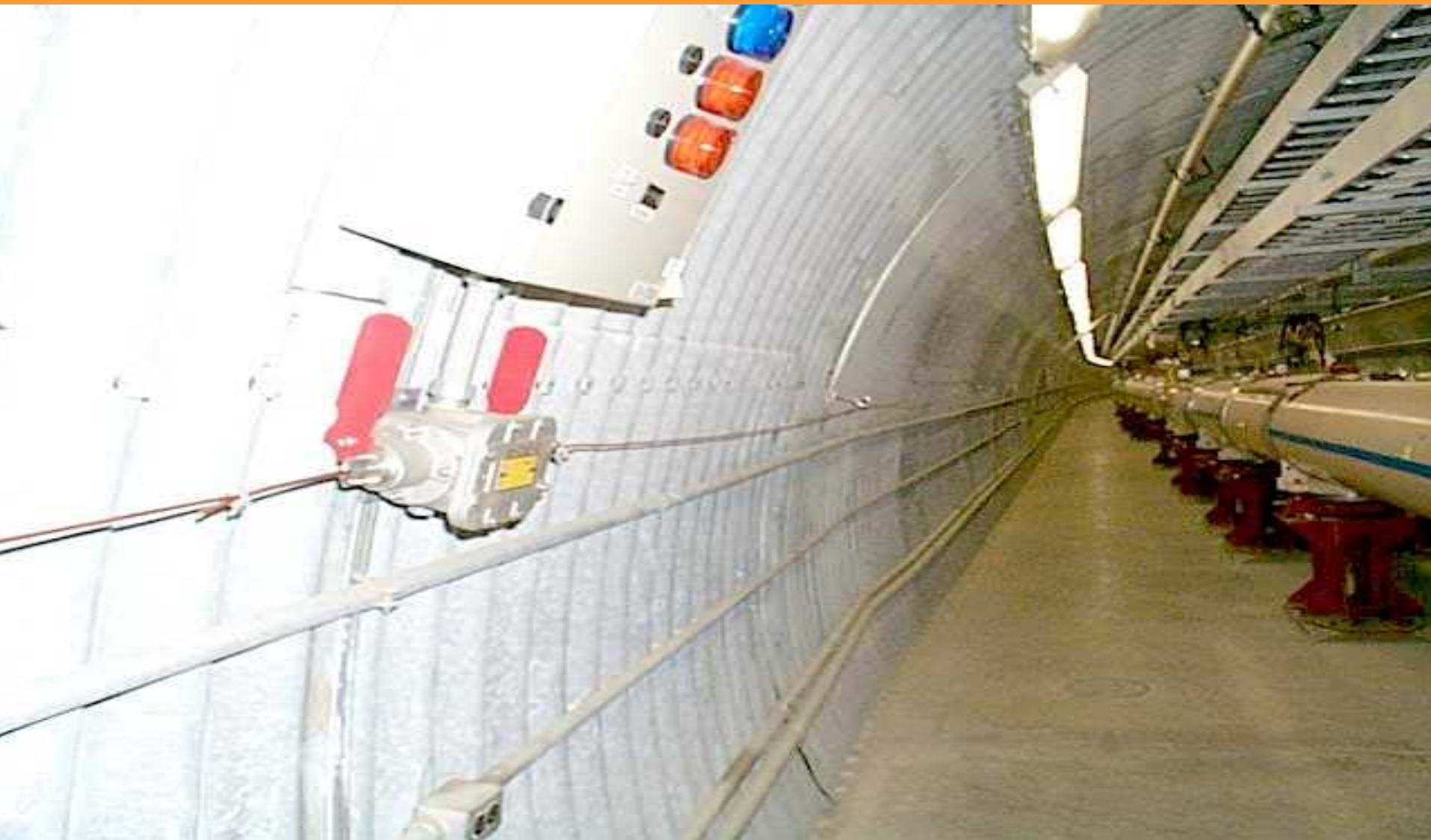
To Enter place card on reader, get green light on reader, open door.

To exit turn knob on door.

IR Entry Procedure
During Controlled Access Mode



CRASH CORDS



Radiation Barriers

Do Not Climb Over Or Defeat Barriers

Electrical Safety Training

This course does **not** allow you to work on energized equipment.

If you work on electrical circuits that are powered through circuit breakers, disconnect switches and/or fuses, then you must LOTO the circuits. All workers performing these tasks must have the appropriate Brookhaven National Laboratory training in electrical safety.

Consult with your Liaison Physicist or Liaison Engineer for details of the training requirements.

TAG NO. 66731

DATE _____ TIME _____

APPARATUS _____

HOLD

DANGER

WRITE REASON IN SPACE BELOW

DO NOT USE, MOVE OR OPERATE
WHILE THIS TAG IS ATTACHED

TAG ATTACHED BY
AND MAY BE REMOVED ONLY BY

PRINT NAME | DEPT. | EXTENSION

RETURN TAG TO ISSUING
OFFICE WHEN NO LONGER REQUIRED

TAG NO. 66731 DATE _____

HAS BEEN ATTACHED TO _____

BECAUSE _____

SIGNED _____

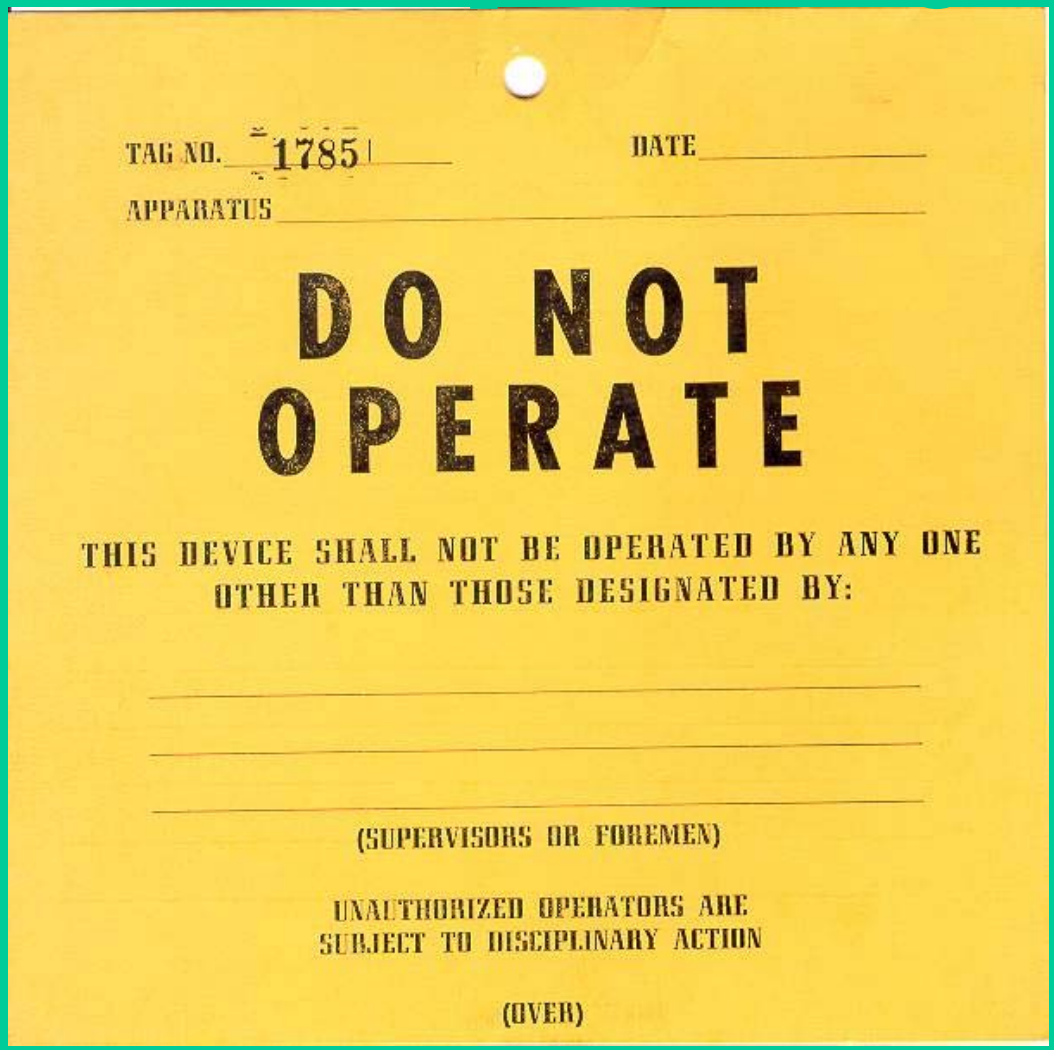
RETURN STUB TO ISSUING OFFICE

BNL F 2791A

LOTO

USE FOR PERSONNEL PROTECTION

USE FOR EQUIPMENT PROTECTION



Red Tags Radiation Safety LOTO

Orange Tags PASS System Equipment

Do not touch equipment. Contact the MCR.

CHIPMUNKS AREA RADIATION MONITORS

SET UP LIKE STOP LIGHTS
RED BLINKING LIGHT FOR GREATER THAN 20mrem/hr
YELLOW BLINKING FOR GREATER THAN 2 mrem/hr
DATA IS STORED AND CAN BE USED TO ESTIMATE DOSE
INTERLOCKS AT HIGH DOSE

CAUTION

MAGNETIC FIELD HAZARD

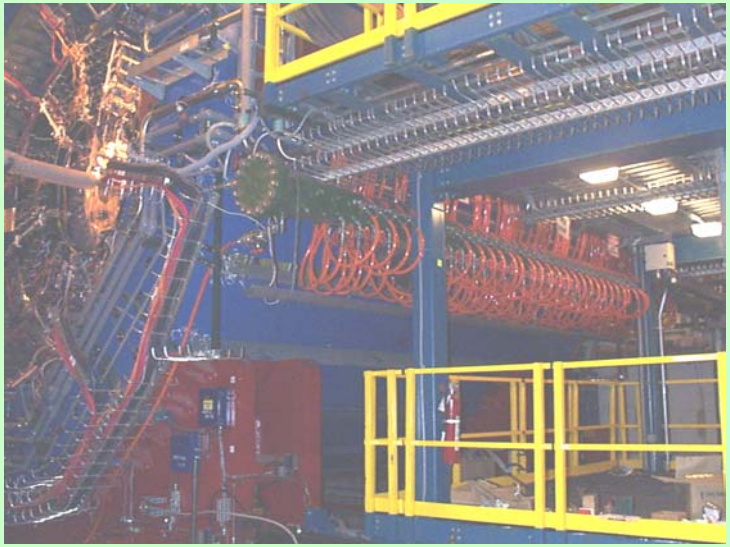
FIELDS > 0.5 mT (5 G)

- MEDICAL EVALUATION AND TRAINING FOR USERS OF:
- CARDIAC PACEMAKER
- ELECTRONIC MEDICAL IMPLANTS

- SEE ES&H COORDINATOR FOR DETAILS


STAR Magnet
STAR Magnetic Field
500 Gauss Field

STAR COOLING SYSTEM



Working at heights above 4 feet

GAS STORAGE

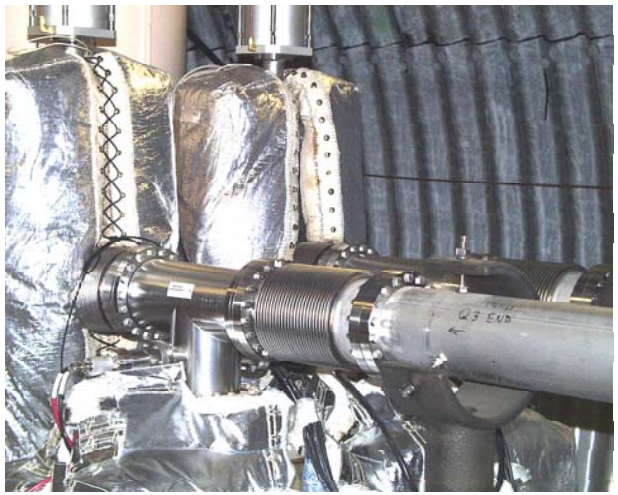
Power Supply / Equipment Room at STAR

ADDITIONAL TRAINING IS REQUIRED TO WORK ON SPECIALIZED SYSTEMS

TRIP HAZARDS AT STAR

LASERS

BEAM PIPES



PIPING ELECTRICAL, WATER, CRYOGENIC

Laser Safety

Lasers must be registered with the BNL Laser Safety Officer:

Includes higher class lasers (Classes IIIb and IV) as well as lower hazard class lasers (Classes II and IIIa).

Classes IIIb and IV require additional Laboratory training. and completion of a Laboratory procedure (SOP).

Classes II and IIIa require a permit.

C-AD Laser Coordinator: Asher Etkin (x4006)

Hardhat Policy

Required at construction areas

Required when people are working overhead

Required when overhead cranes are handling objects overhead

Noise

CAUTION

NOISE AREA

LEVELS TO 90 dBA WITH EQUIPMENT ON

EAR PROTECTION REQUIRED FOR OCCUPANCY > 5 MINUTES

EXPLOSIVE GAS IN USE

NO IGNITION SOURCES

Work Planning and Hazard Screening

All internally initiated jobs at C-A must be screened for ES&H hazards. The hazards for C-A work planners who are involved in screening are as follows:

Low-Hazard (Skill of the Craft) Work: Work requiring the attention of the average performer to prevent minor injury. Failure to correctly perform low-hazard work would not damage equipment or structures or release potentially hazardous materials to the environment, except as a result of gross negligence.

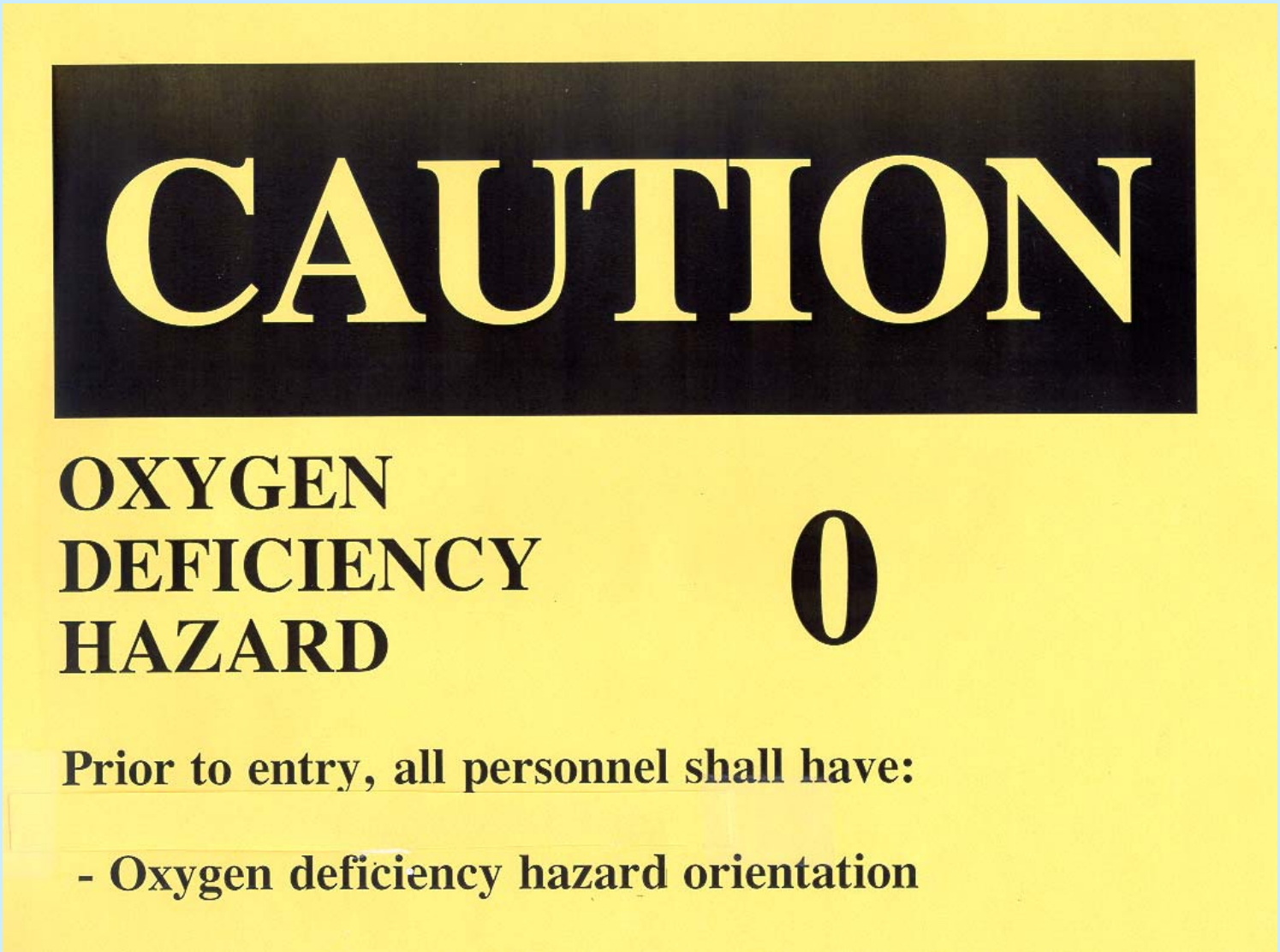
Green Work Permits For Moderate/High Hazards

Moderate-Hazard Work: Work requiring coordinated actions to prevent any injury to personnel, minor damage to equipment or structures, or release of hazardous materials to the on-site environment.

High-Hazard Work: Work requiring coordinated actions to prevent serious injury to personnel, significant damage to equipment or structures, or releases of reportable quantities of potentially hazardous materials to the off-site environment.




Oxygen Deficiency Hazard Signs



What Is Oxygen Deficiency?

Normal atmospheric content is:

20.9% oxygen, 78% nitrogen, 1% argon

Oxygen deficiency is defined as < 19.5% oxygen

This happens when air in an enclosed space is displaced by another gas

What Causes Oxygen Deficiency?

- Cryogenic systems use large amounts of liquid helium.
- The liquid expands about 700-800 times when released in air.
- This could happen quickly with a major release as a result of a catastrophic failure. A rapidly expanding, white cloud and possible “whooshing” sound.
- Could be slow, invisible and silent leak.
- The gas is colorless and odorless.

Classification of ODH Levels

- There are five classes: 0 through 4, with 0 being the least hazardous.
- Classification is based on the likelihood of fatality.
- **This training only allows access into CLASS 0 areas**.
- Additional training and control measures are required for Class 1areas.

Class 0 ODH Areas at Collider

- Buildings at RHIC with Valve Boxes
  - Support Buildings 1002B, 1004B, 1006B, 1008B
  - Service Buildings 1010A and 1012A
  - Helium Compressor in building 1005H and 1005E
- Collider Ring, BRAHMS, PHOBOS, and PP2PP

Class 1 ODH Areas at the Collider

- There is one area at the Collider with ODH 1 classification (building 1005H refrigerator).

Effects of Oxygen Deficiency

Vol % O_2	Effect on Healthy Person	Approx Time
17	Deep breathing, Faster heartbeat	Rapidly
16	Dizziness, slower reaction time	
15	Impaired attention and coordination Intermittent Breathing Rapid Fatigue	
12	Very Faulty judgement Inability to move Loss of consciousness, brain damage	10 min 10 min 2 hours
10	Inability to move, nausea, vomiting Loss of consciousness	4 min 10 min
6	Loss of consciousness Coma Death	30 sec 1 min 5 min

When Is Evacuation Required?

- When the in-place oxygen monitors set off an alarm.

  At the COLLIDER: Blue Strobe Light

  and Audible Alarm

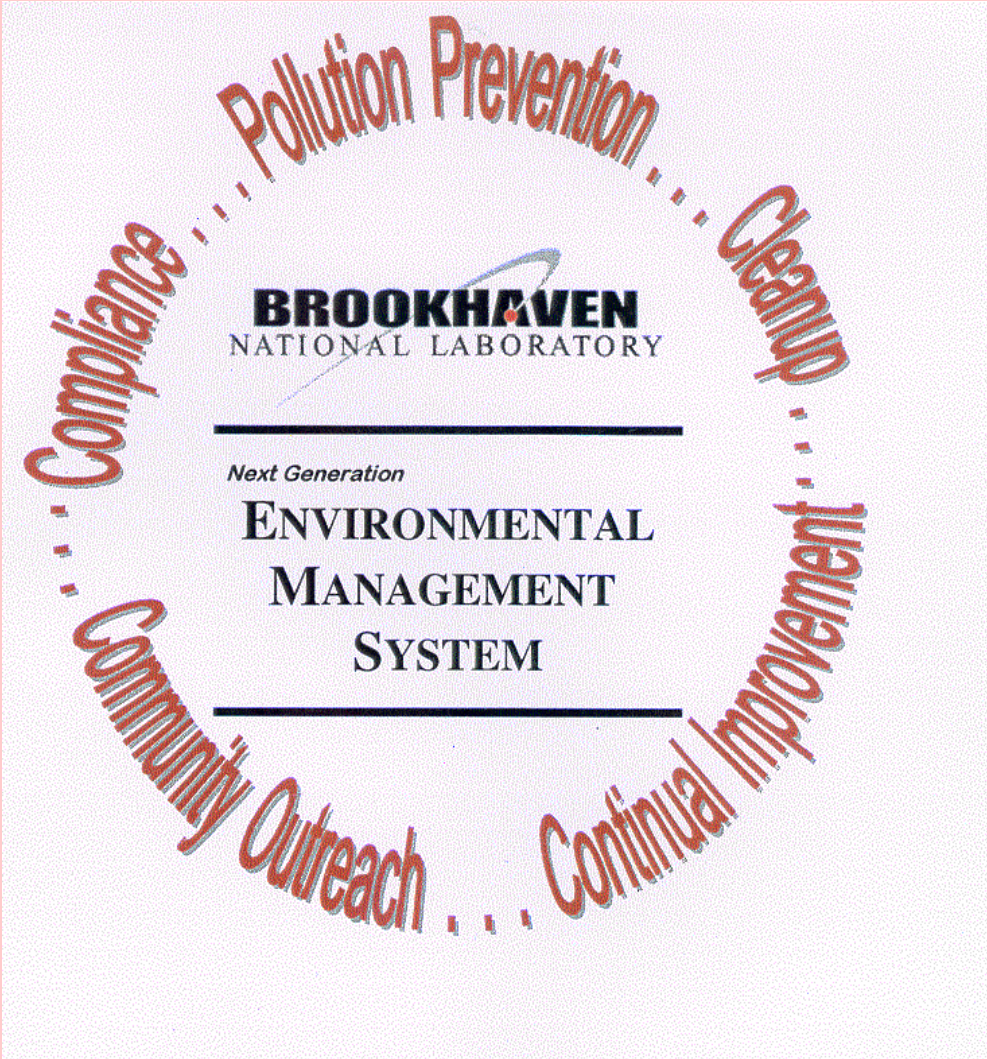
OR:

- A Vapor cloud is observed or a loud whooshing sound is heard inside the ODH area (even if no alarm sounds).

Evacuation Procedure

- Leave the area, moving away from any vapor cloud (lethal freezing hazard) or any noise.
- Stay Low!
  - Duck under magnets to get to exits.
  - Do not use overpasses to cross the beamlines.
  - Do not use vertical (ladder) exits.
  - Use only horizontal exits.
- Call 2222 or 911 if anyone is injured or trapped.
- DO NOT ATTEMPT A RESCUE as you are likely to be the next victim! Let the pros handle it.

Pollution Prevention at C-A



Waste Disposal

Improper disposal of radioactive waste or hazardous waste may result in fines, criminal prosecution, and facility shutdown.

- Contact the C-A Environmental Coordinator (x7520) for information on any waste.
- Contact the C-AD Environmental Compliance Representative (ECR x2905) prior to establishing any airborne, liquid, or solid radioactive or hazardous waste stream.

Spill Reporting

- The C-A Department is required to report spills; internally, externally, or BOTH.
- C-AD must report ***quickly*** to external agencies on spills that impact the environment.
- Even minor events, such as spilling any amount of oil in an outdoor area, require reporting.
- If you spill any hazardous or industrial material outdoors on the ground, or anywhere inside and the spill is beyond your control, call x2222 or 911 to report the spill. Then call:

  C-AD Main Control Room (x4662), the C-AD ESHQ Division Head (x5272) or the C-AD Environmental Coordinator (x7520).

- For any spill, notify your Experiment Spokesperson and/or your Liaison Physicist.
- Do not leave a message on an answering machine as notification.
- When reporting, give your name and information on the spill location, type of material and approximate amount.

Material Safety Data Sheets - MSDS

- Name of Chemical
- Manufacturer
- Hazardous Ingredients
- Physical Characteristics
- Fire and Explosion Data
- Reactivity Data
- Health Hazard Data
- Safe Handling Data
- Safety Control Measures

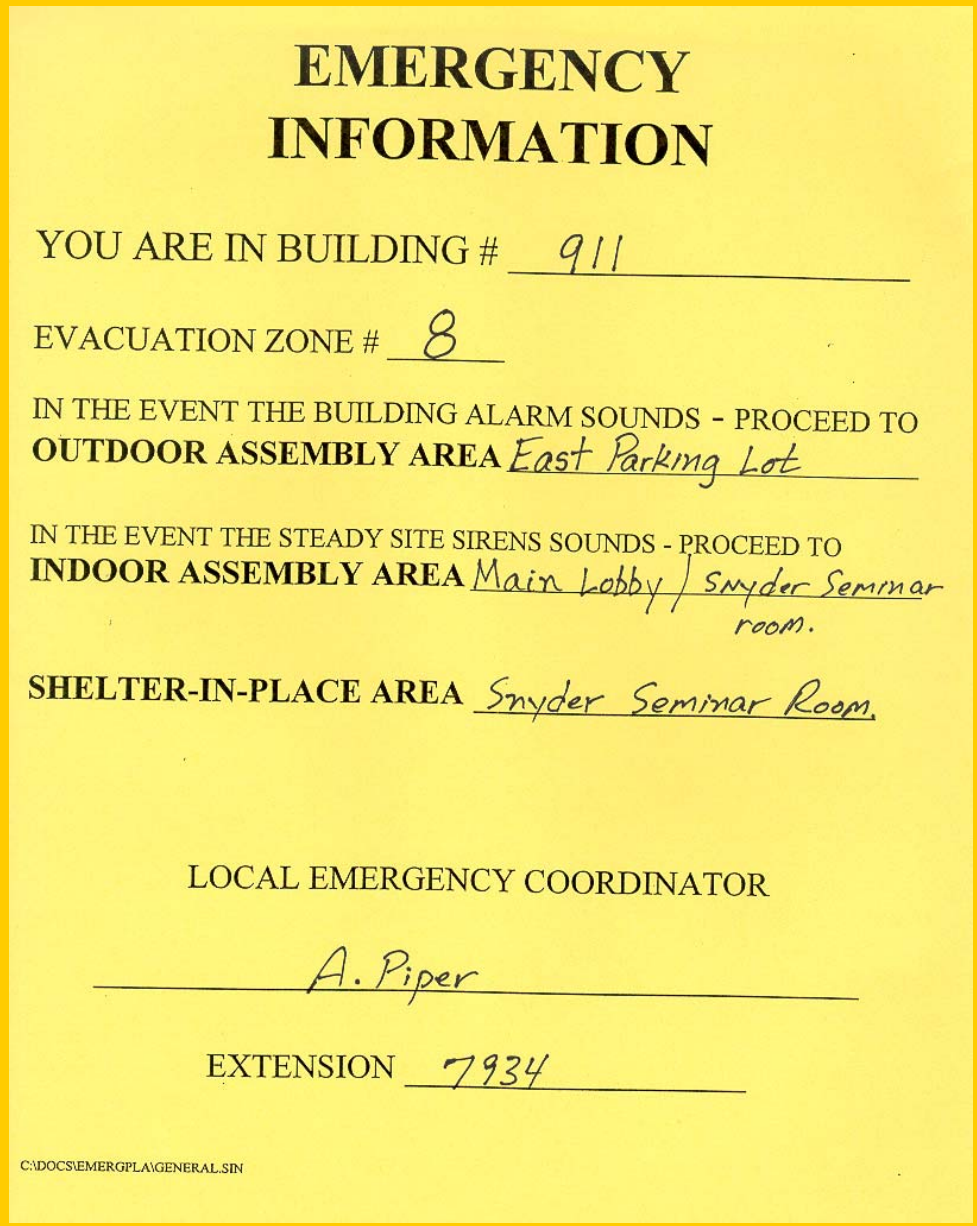
Available from the C-AD ES&H Coordinator

Compressed Gas Cylinder Handling

General Rules

- Do not drop cylinders or permit them to violently strike each other
- Do not roll cylinders in a horizontal position
- Do not drag cylinders
- Do not handle cylinders with oily hands or gloves (This is especially important when handling oxygen and other oxidizers)
- If hoisting is necessary, use a suitable cradle or platform
- Do not lift cylinder by its cap
- Keep cylinder caps on the cylinder whenever they are not in use
- Transport cylinders using a cart or hand truck designed for that purpose

ASSEMBLY AREA POSTING



EMERGENCY INFORMATION

YOU ARE IN BUILDING # 911

EVACUATION ZONE # 8

IN THE EVENT THE BUILDING ALARM SOUNDS - PROCEED TO
OUTDOOR ASSEMBLY AREA East Parking Lot

IN THE EVENT THE STEADY SITE SIRENS SOUNDS - PROCEED TO
INDOOR ASSEMBLY AREA Main Lobby / Snyder Seminar room.

SHELTER-IN-PLACE AREA Snyder Seminar Room.

LOCAL EMERGENCY COORDINATOR

A. Piper

EXTENSION 7934

C:\DOCS\EMERGPLA\GENERAL.SIN

Summary of Alarm Signals

Response to Continuous or Intermittent Bells

- Fire Alarm

Exit the area, report to the outdoor assembly area.

Response to Yellow Strobe and Audible Alarm

- Flammable or Explosive Gas Alarm

Exit the area, report to outdoor assembly area.

Response to Orange Strobe and Audible Alarm

- Beam Immanent Alarm

Pull crash cords or exit though access gate, contact MCR

Response to Blue Strobe and Audible Alarm

•ODH Event

Exit the area through horizontal exits; stay low

DO NOT RENTER buildings. Wait for further instructions from Fire Captain or ES&H Coordinator.

Emergency (Injury / Illness)

- If there is an <u>emergency</u> such as an illness or injury, pull the fire alarm pull-box and call 911or 2222.

- If you are injured, report as soon as possible to the BNL Occupational Medicine Clinic (OMC), located in building 490.

C-AD Escort Policy

CONTACT C-AD ESHQ Division:

John Maraviglia (x7343)

or

Ray Karol (x5272)

or

Asher Etkin (x4006)

Note Your Surroundings

- Exits
- Fire Alarm Pull Boxes
- Intercoms / Telephones
- Emergency exhaust
- TLD Requirements
- Conventional and Radiological Safety Hazards
- Safety Equipment
- Assembly Areas

Staffing Levels and Safety

- Rules shall be followed even when you are short-handed.
- Do not violate Safety rules to get the job done.
- Do not use a procedure that you have not been trained on although you feel it will please your supervisor.